TII:

Voltage Regulators

Unclassified

3 Hour Conference, W/ 4Hr PE1

Safety & Environmental Impact is “LOW”

TII: Voltage Regulators

Terminal Learning Objective

Action: Given schematic diagram of the series voltage regulators, Zener Diodes & Circuit concepts of operation. Answer applicable questions.

In addition troubleshoot the PC 25 & 26 Ckts utilizing the correct procedure & method and demonstrate by correctly recording the results in locating & identifying the malfunctions.

Condition: W/O reference.

Standard: 7 of 10 Questions answered correctly.

TII: Voltage Regulators

Introduction

The last circuit in the power supply is the regulator.

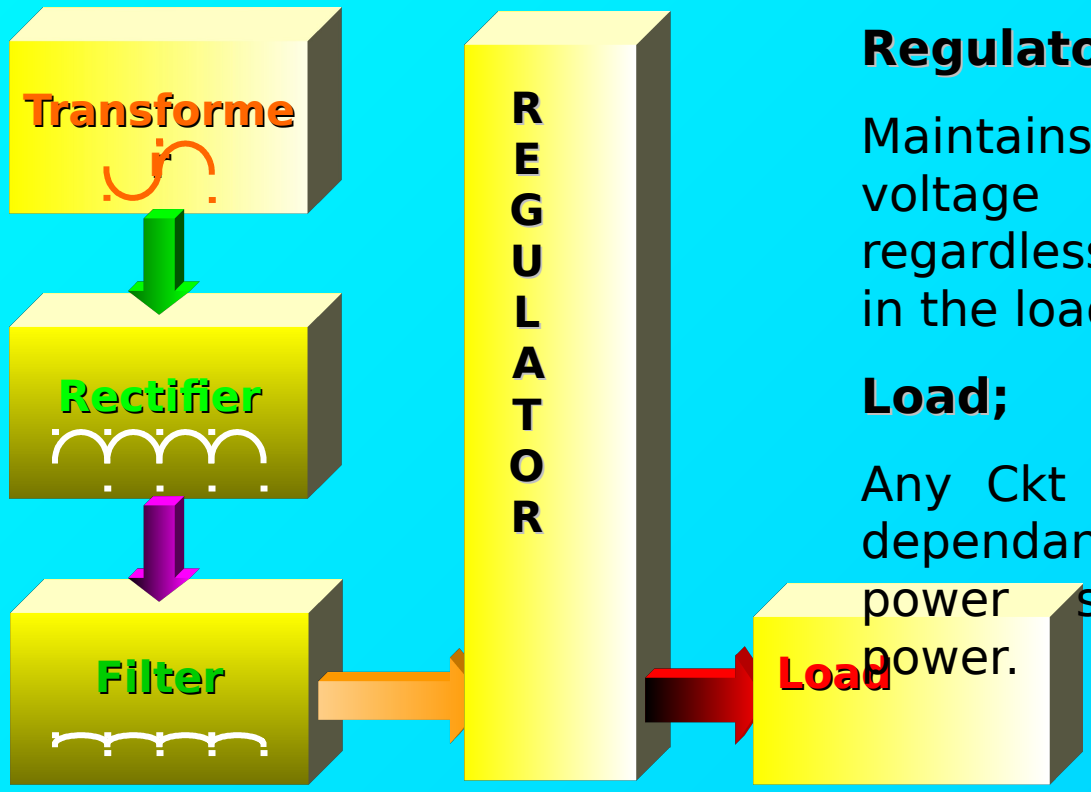
In a previous lesson we observed in the unregulated supply, that as the load changed the voltage applied changed.

The voltage regulator will hold a constant voltage as the load changes in operation.

Block Diagram

TII: Voltage Regulators

Power Supply: Block Diagram Circuits.



Regulator;

Maintains a constant voltage or current, regardless of the change in the load.

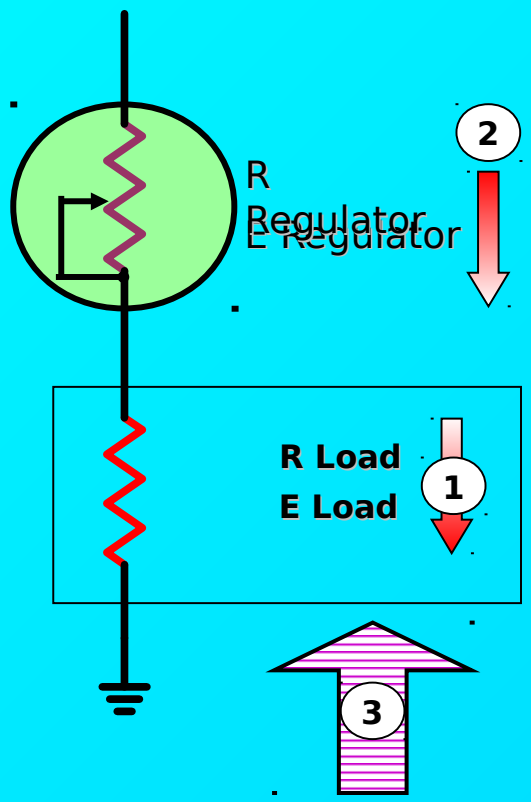
Load;

Any Ckt or Ckts that is dependant upon the power supply for its power.

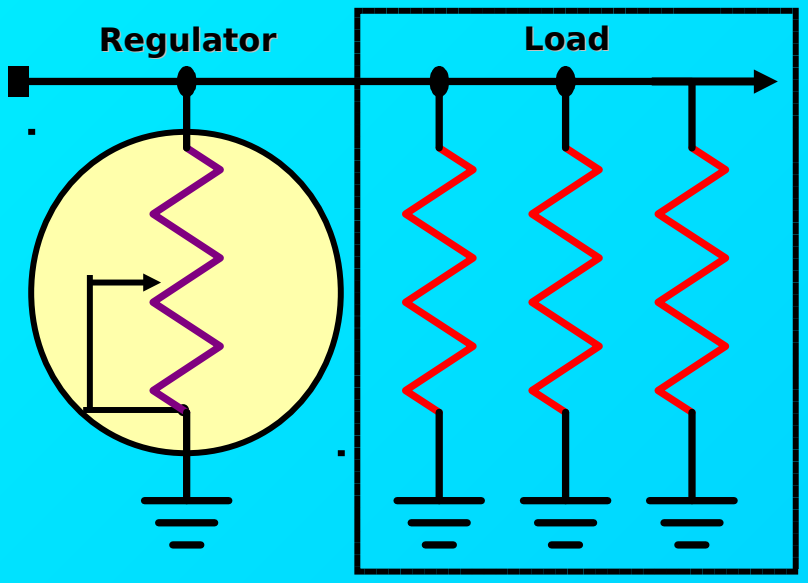
2 Types

TII: Voltage Regulators

Regulator 2 Types; Series & [Parallel or Shunt].



Series Regulator



If ; REQ ↓ , EREQ ↓

↑ R of Regulator, & E Regulator ↑

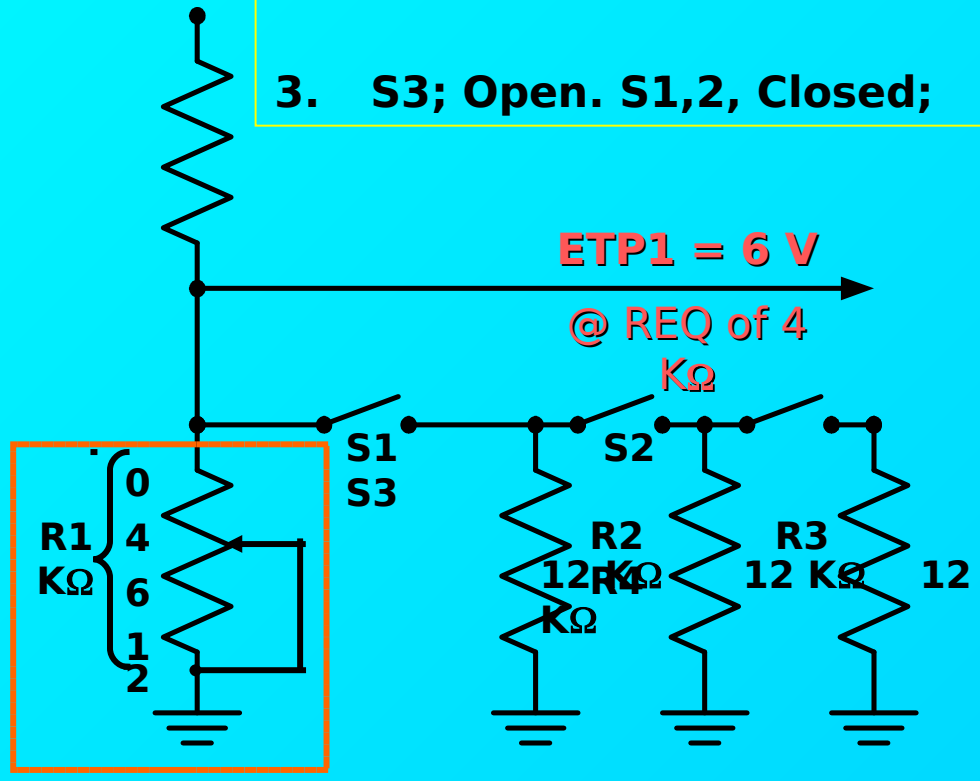
Parallel Regulator

Parallel

TII: Voltage Regulators

Regulator Parallel; Concept.

1. S1, 2, 3; Open; Adjust R1 =___ ,
2. S2, 3; Open, S1 Closed; Adjust R1 =___ ,
3. S3; Open. S1,2, Closed; Adjust R1 =___ ,



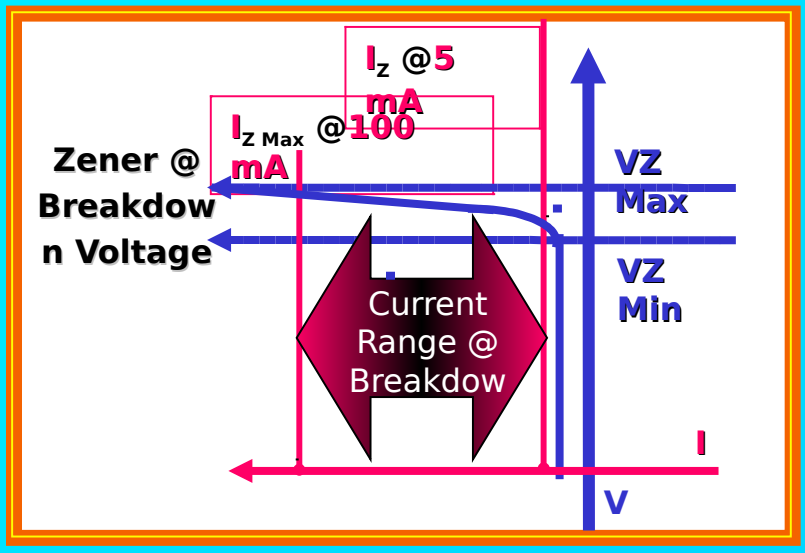
Adjust R1 Regulator to = 6v @ the test point.

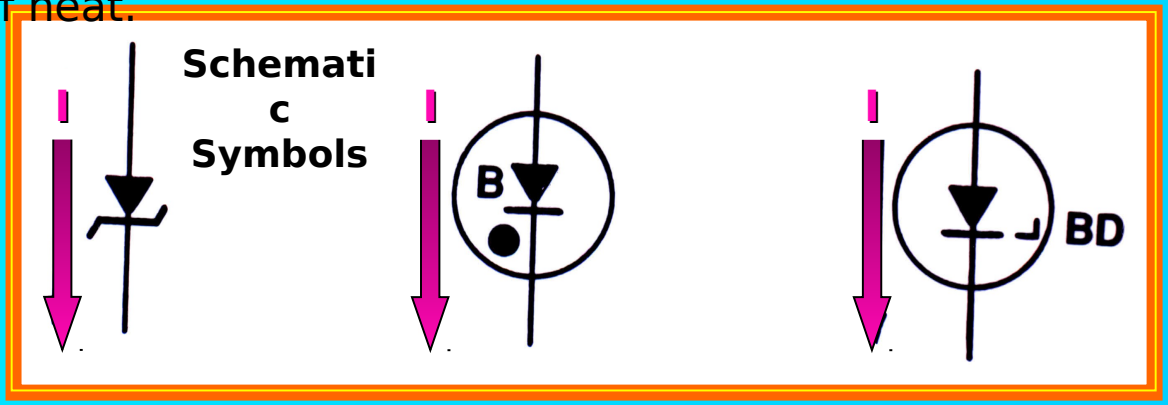
Zener

TII: Voltage Regulators

Zener Diode;

1. Also known as an Avalanche or Breakdown Diode.
2. Op's in Reverse Bias mode.
3. Can recover quickly from avalanche mode. Heat is dissipated across the PN junction more efficiently than the conventional type diode. Heat sinks also enhance the ability to throw off heat.
4. Current flows in the direction of the arrow.
5. **F↑ I ↑ R↓ E↔**
6. Voltage is constant.

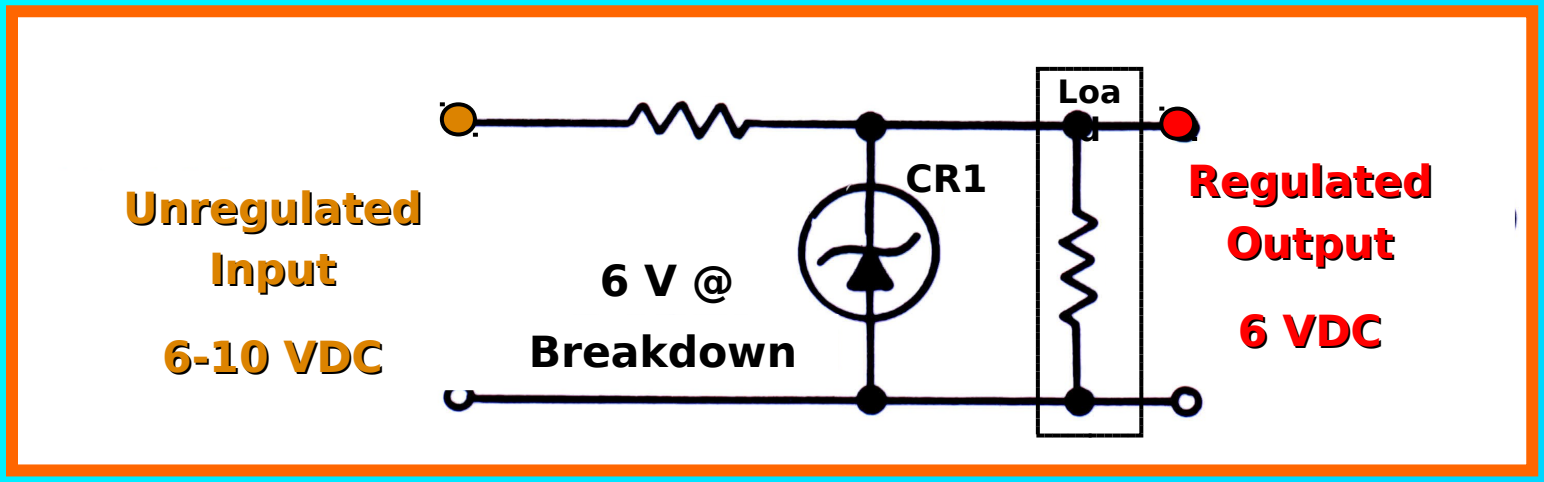




Zener Regulator

TII: Voltage Regulators

Zener Regulator; Parallel or Shunt Type.



As the Resistance of the load ↑ & the Voltage Drop ↑

CR1 Zener Regulator Avalanches [R-Bias], Current Flow ↑ thru CR1, Thus ↓'s Current flow thru the load & the voltage drop of the load ↓'s.

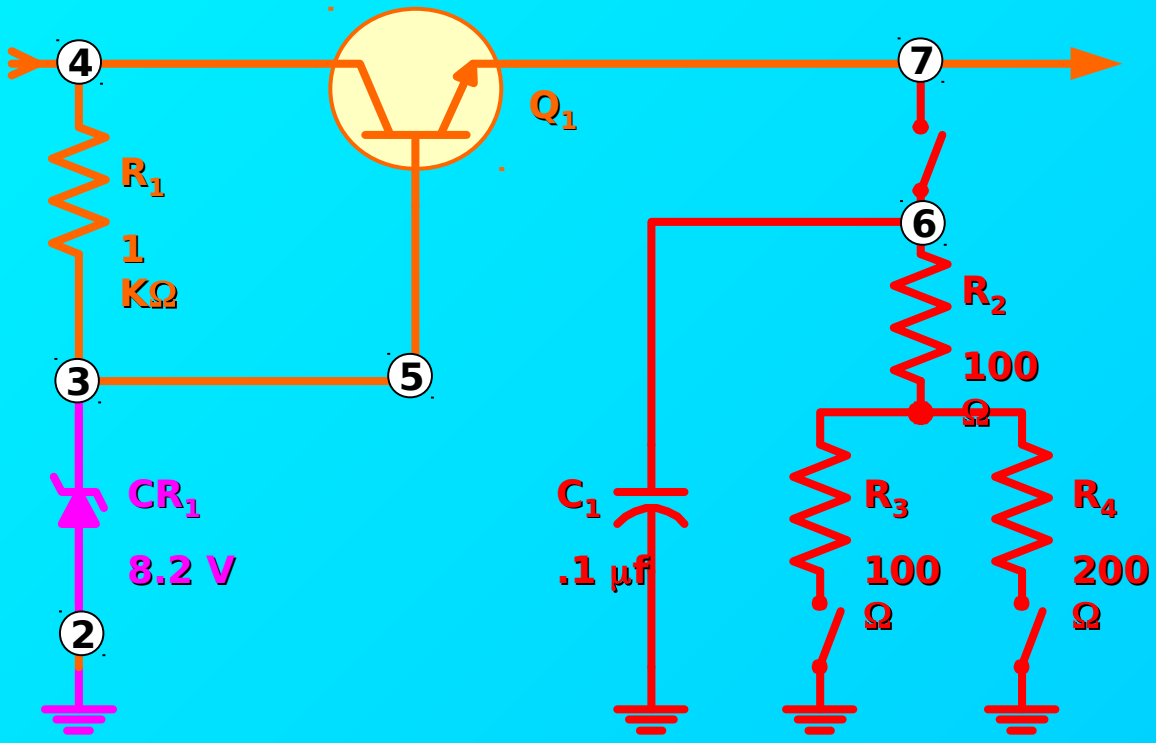
TII: Voltage Regulators

PC 25: Circuits

Regulator Ckt;
Q1, R1

Reference Ckt;
CR1

Load;
R2, 3 & 4, C1



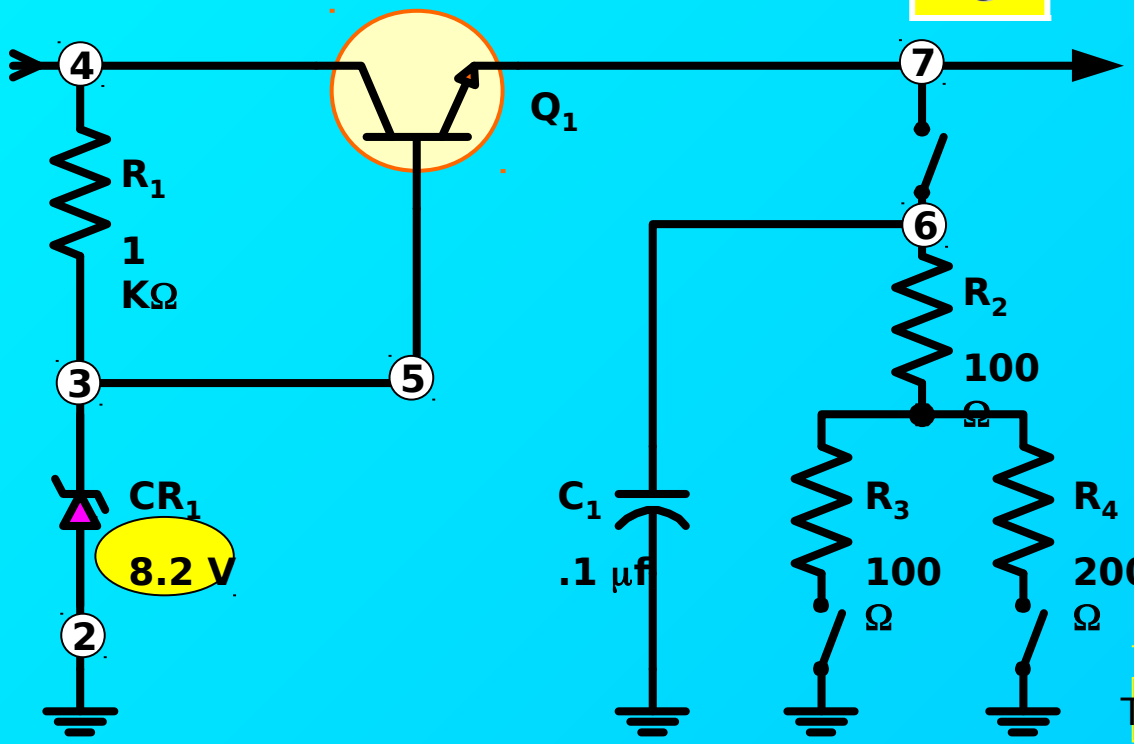
Ops

TII: Voltage Regulators

PC 25: Operation

7 – 8.2 = 1.2 Normal Q1 Bias

7 VDC



TP7; Increase

TII: Voltage Regulators

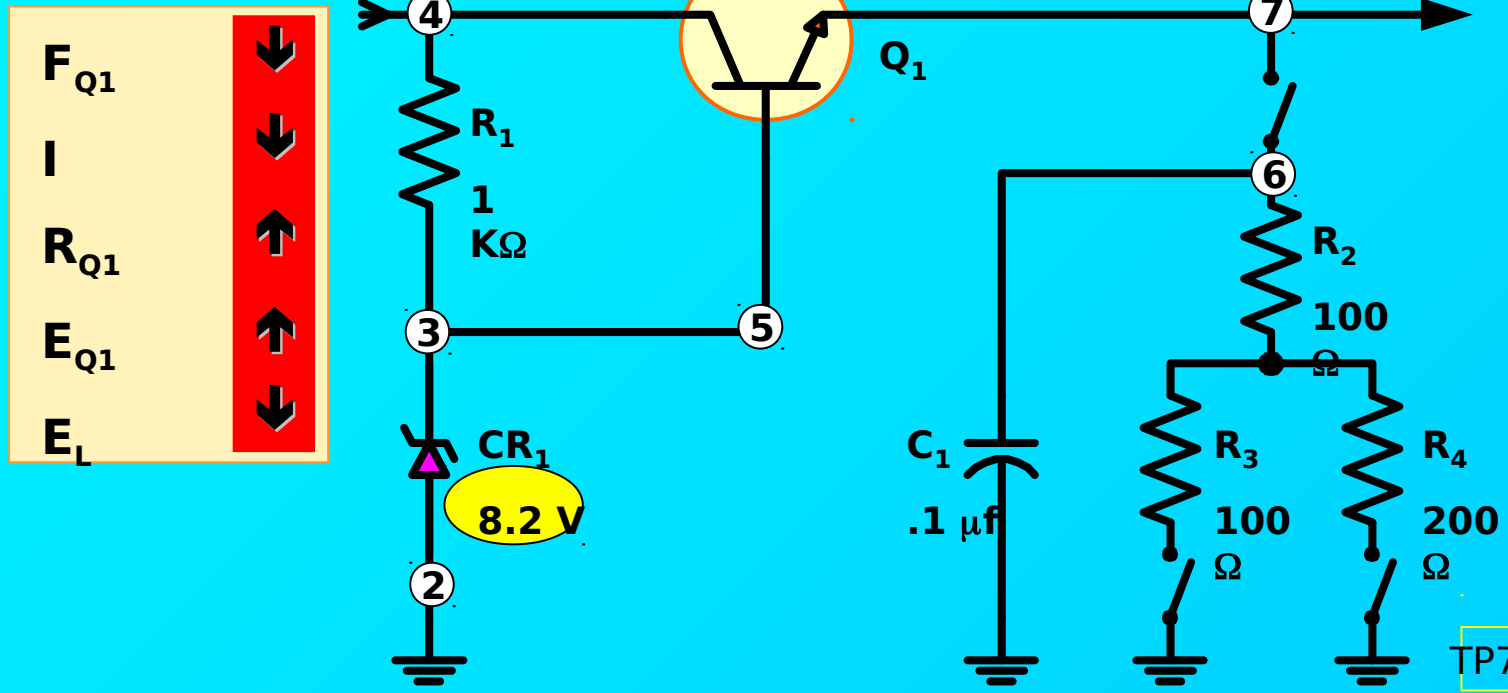
PC 25: Operation, Load Increases.

↑ 9 – 8.2 = ↓ .8 Q1 Bias Decreases

7 – 8.2 = 1.2 Normal Q1 Bias

↑ 9 VDC

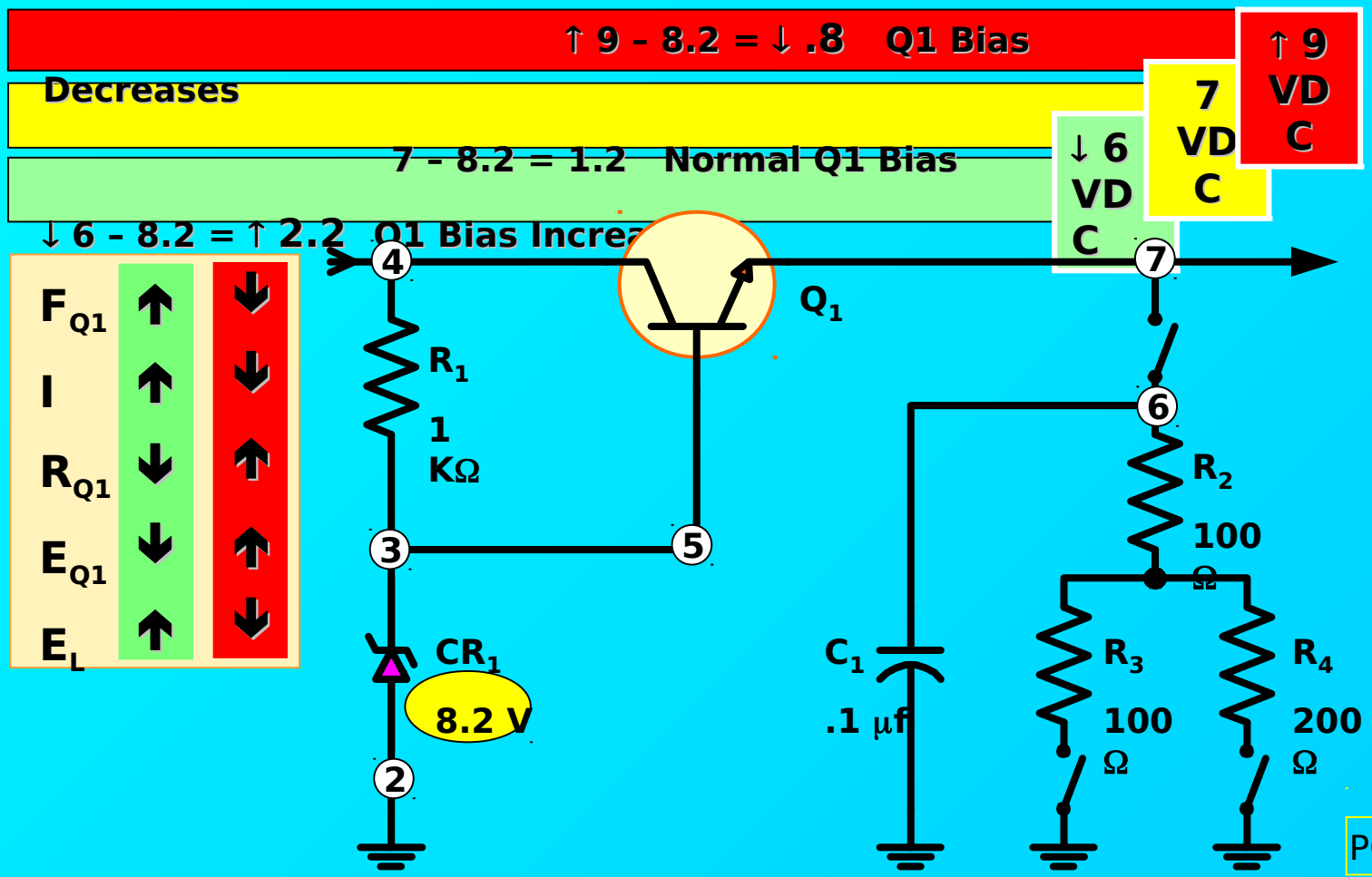
7 VDC



TP7; Decrease

TII: Voltage Regulators

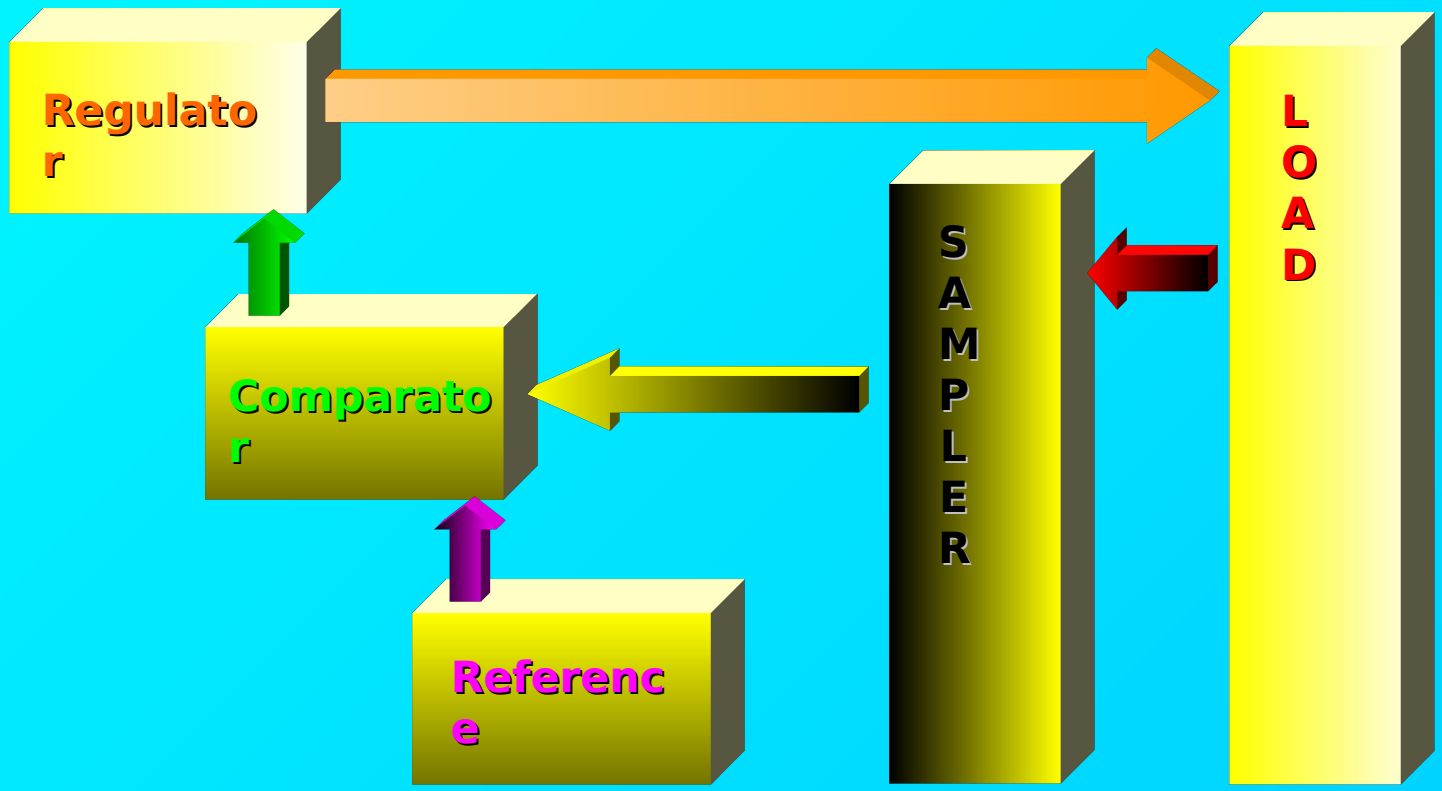
PC 25: Operation, Load Decreases.



PC 26 Block

TII: Voltage Regulators

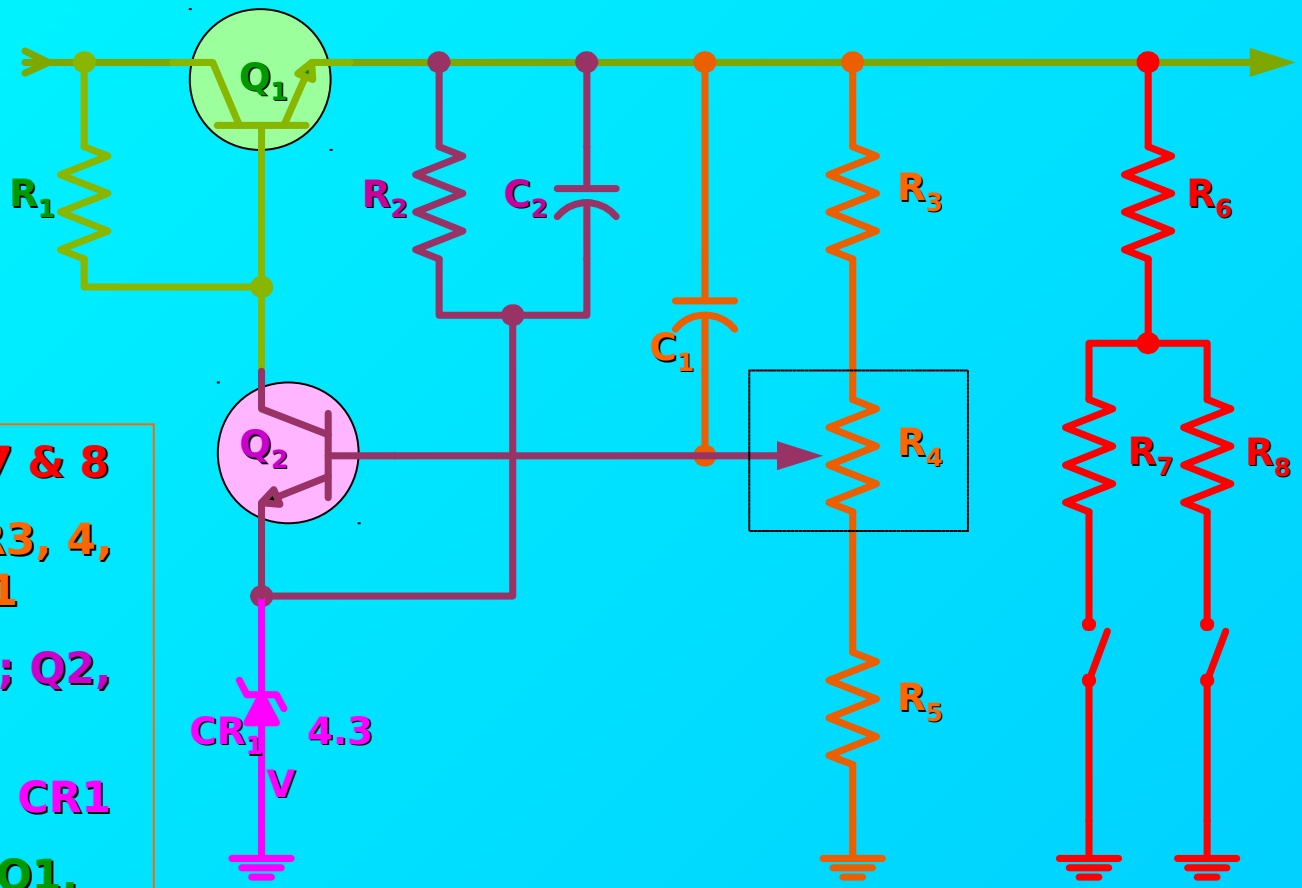
PC 26: Circuits Block Diagram



Ckt Comp

TII: Voltage Regulators

PC 26: Circuits



Load; R6, 7 & 8

Sampler; R3, 4, 5, & C1

Comparator; Q2, R2, C2.

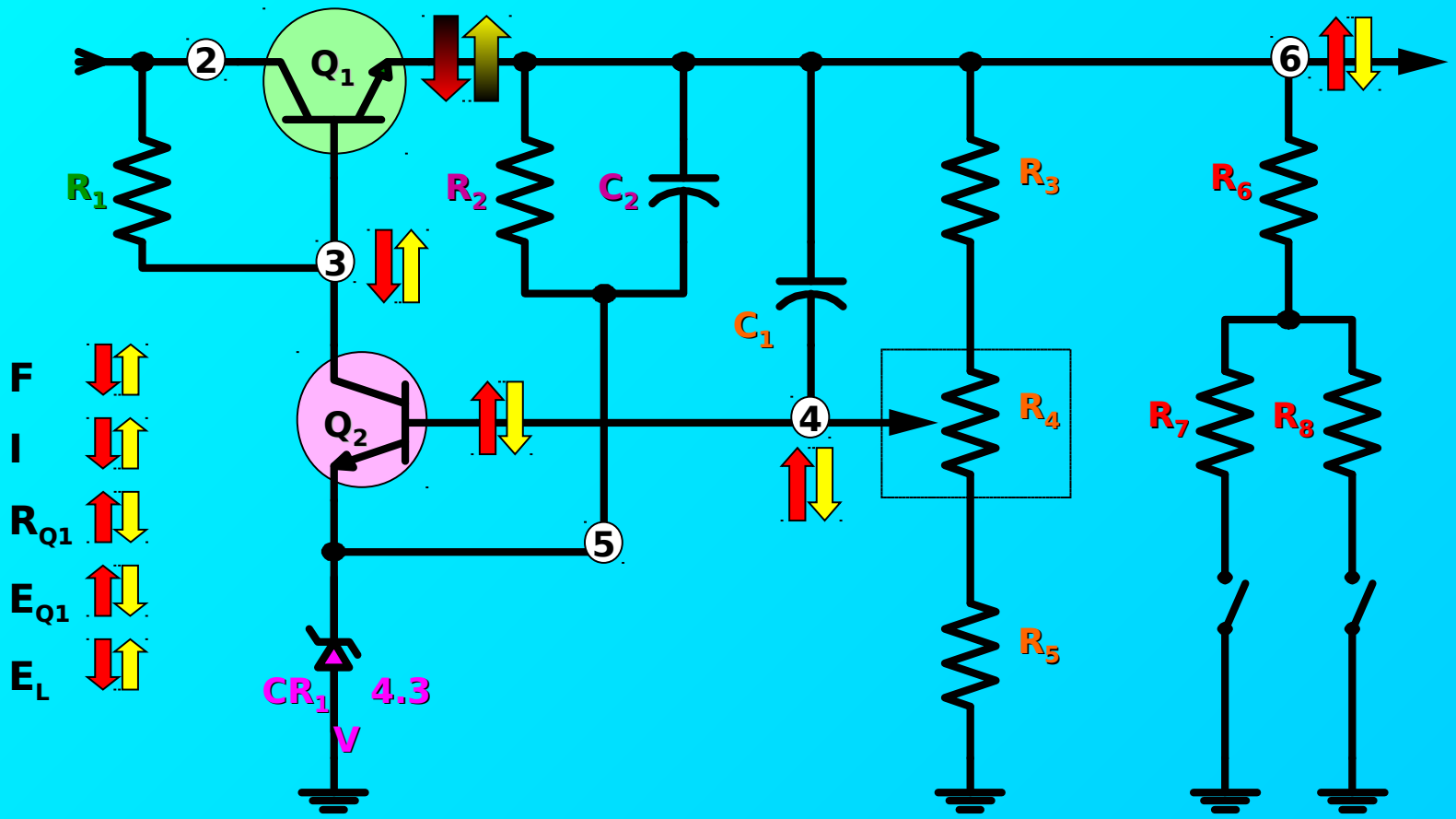
Reference; CR1

Regulator; Q1, R1.

Ops

TII: Voltage Regulators

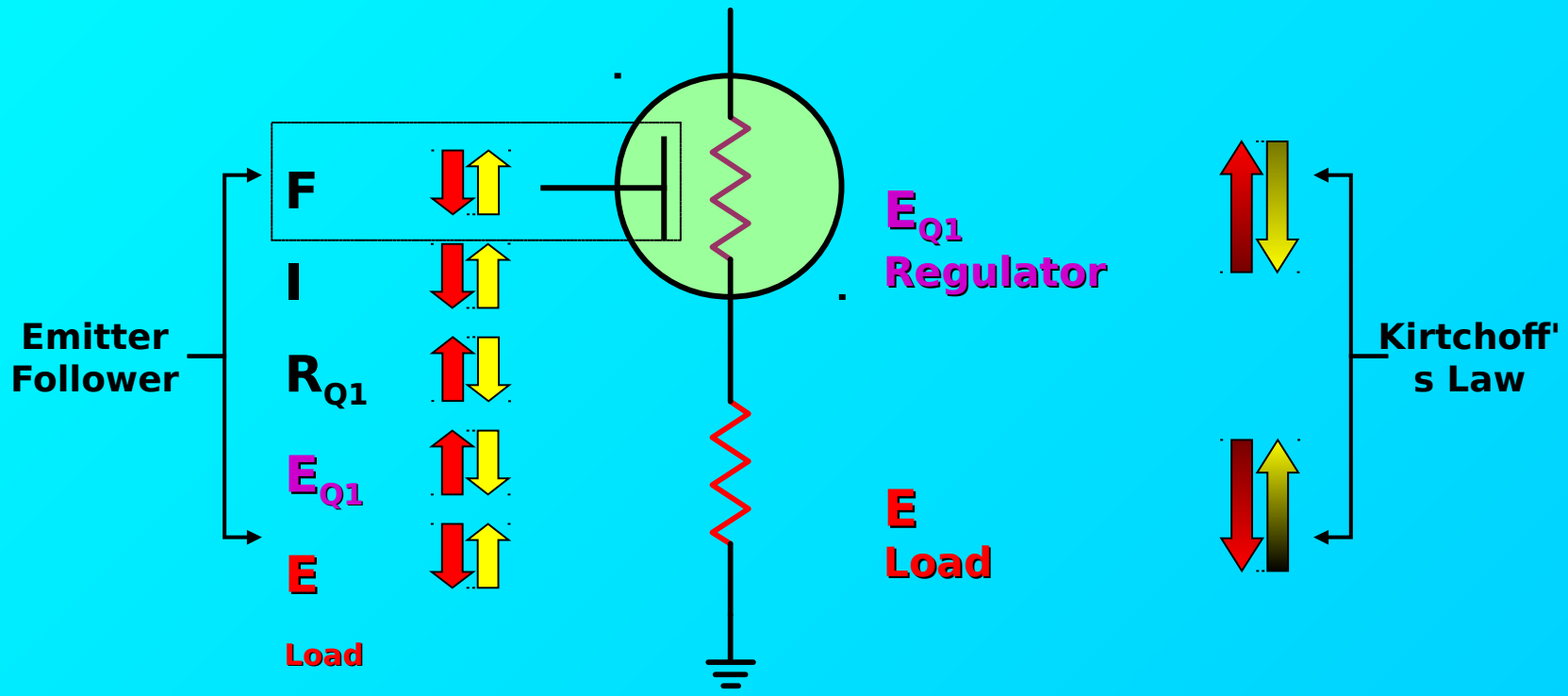
PC 26: Circuit Ops



Concept

TII: Voltage Regulators

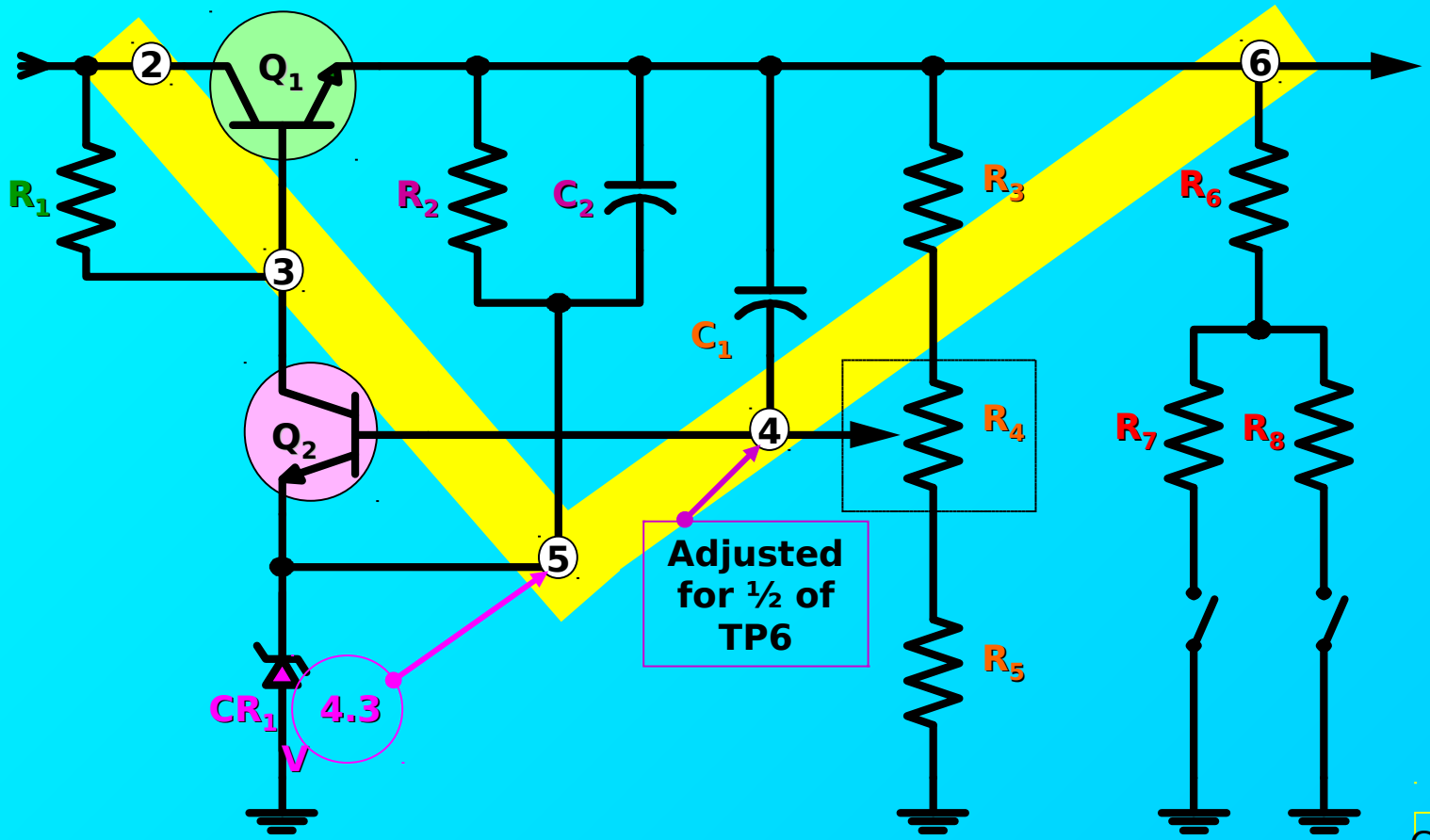
PC 26: Circuit Ops Concept.



Trouble Shoot

TII: Voltage Regulators

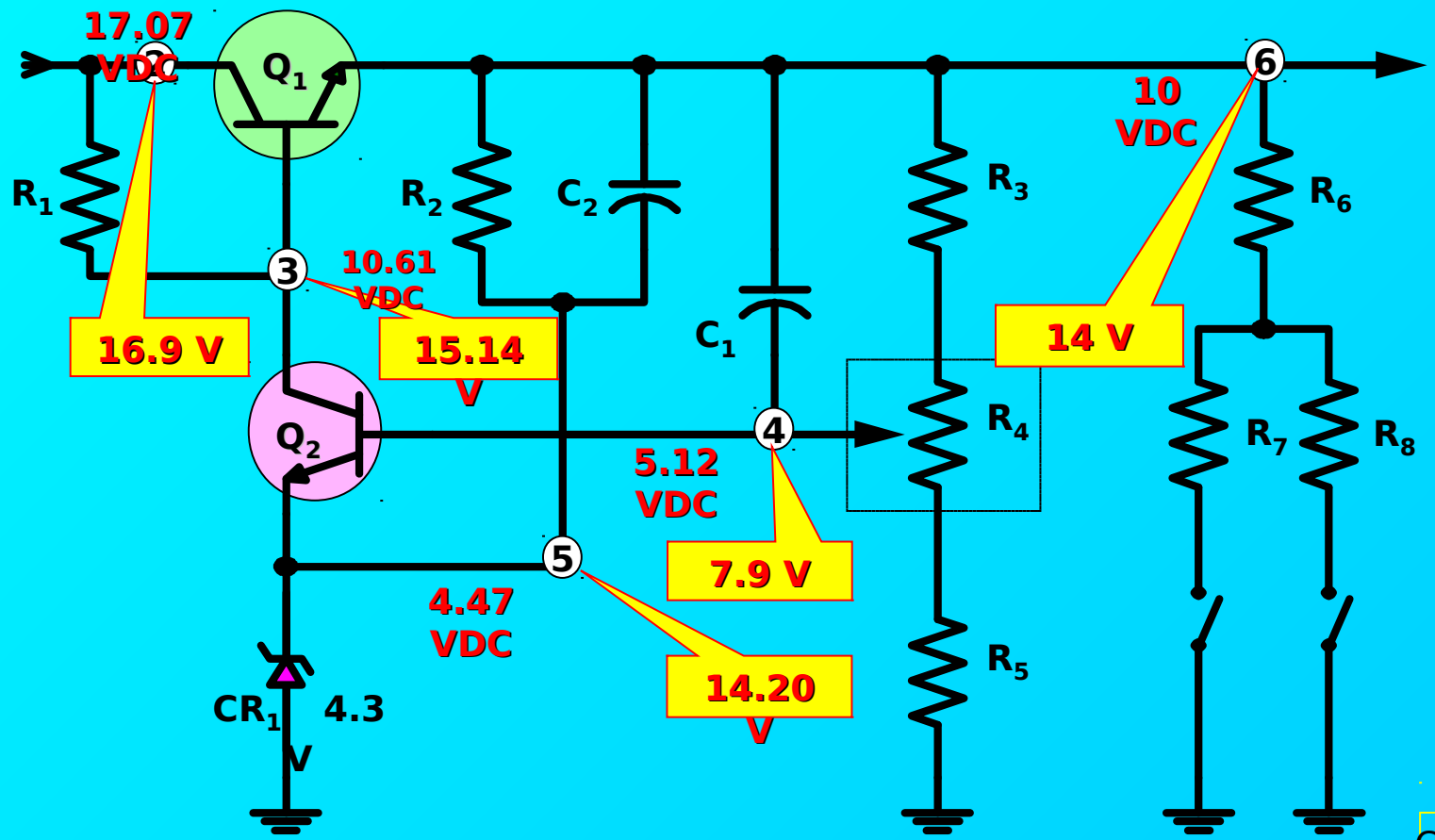
PC 26: Trouble Shooting Sequence, TP 6, 4, 5, 3, 2.



Challenge

TII: Voltage Regulators

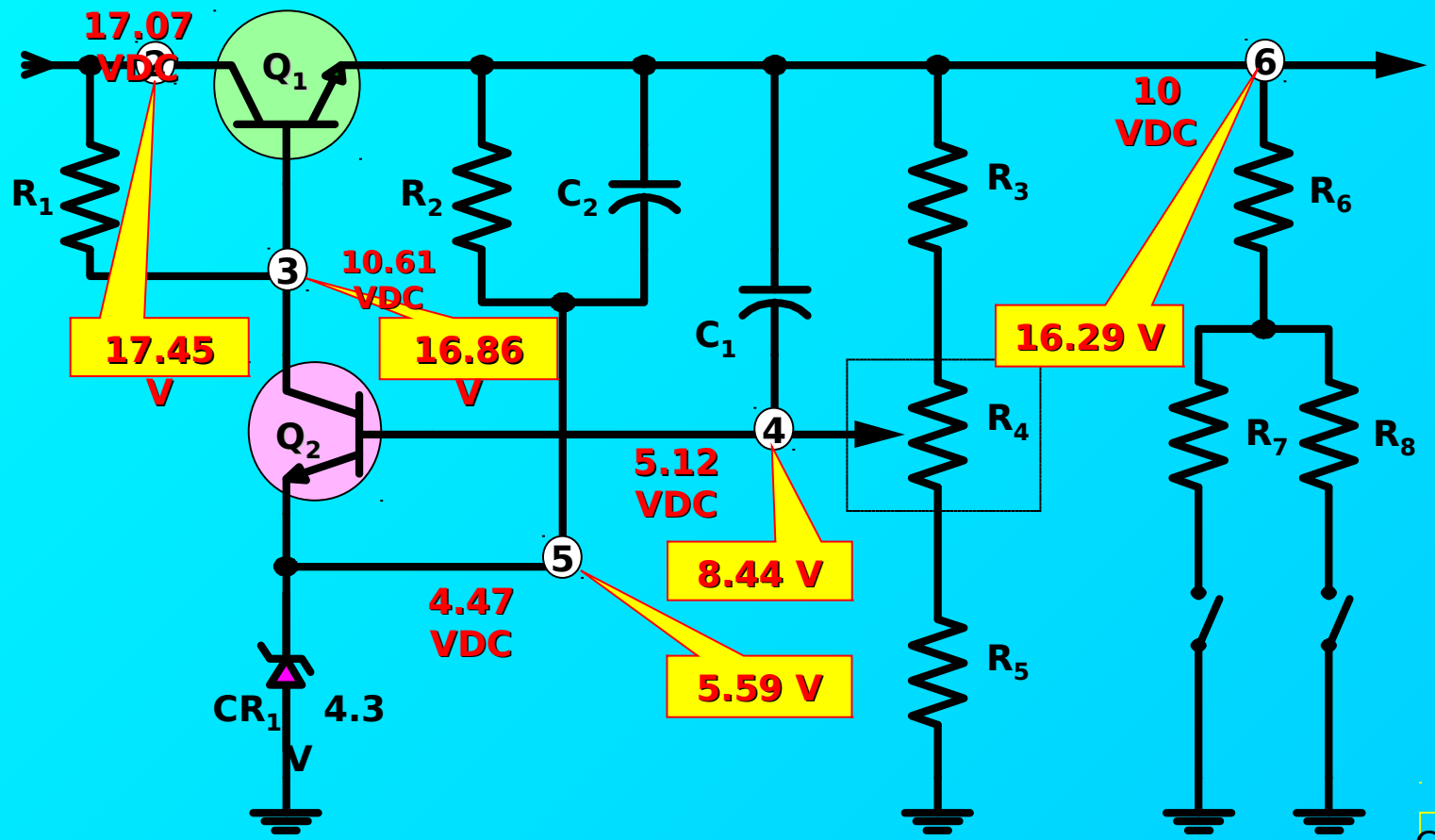
PC 26: Trouble Shooting, Malfunction 1.



Challenge

TII: Voltage Regulators

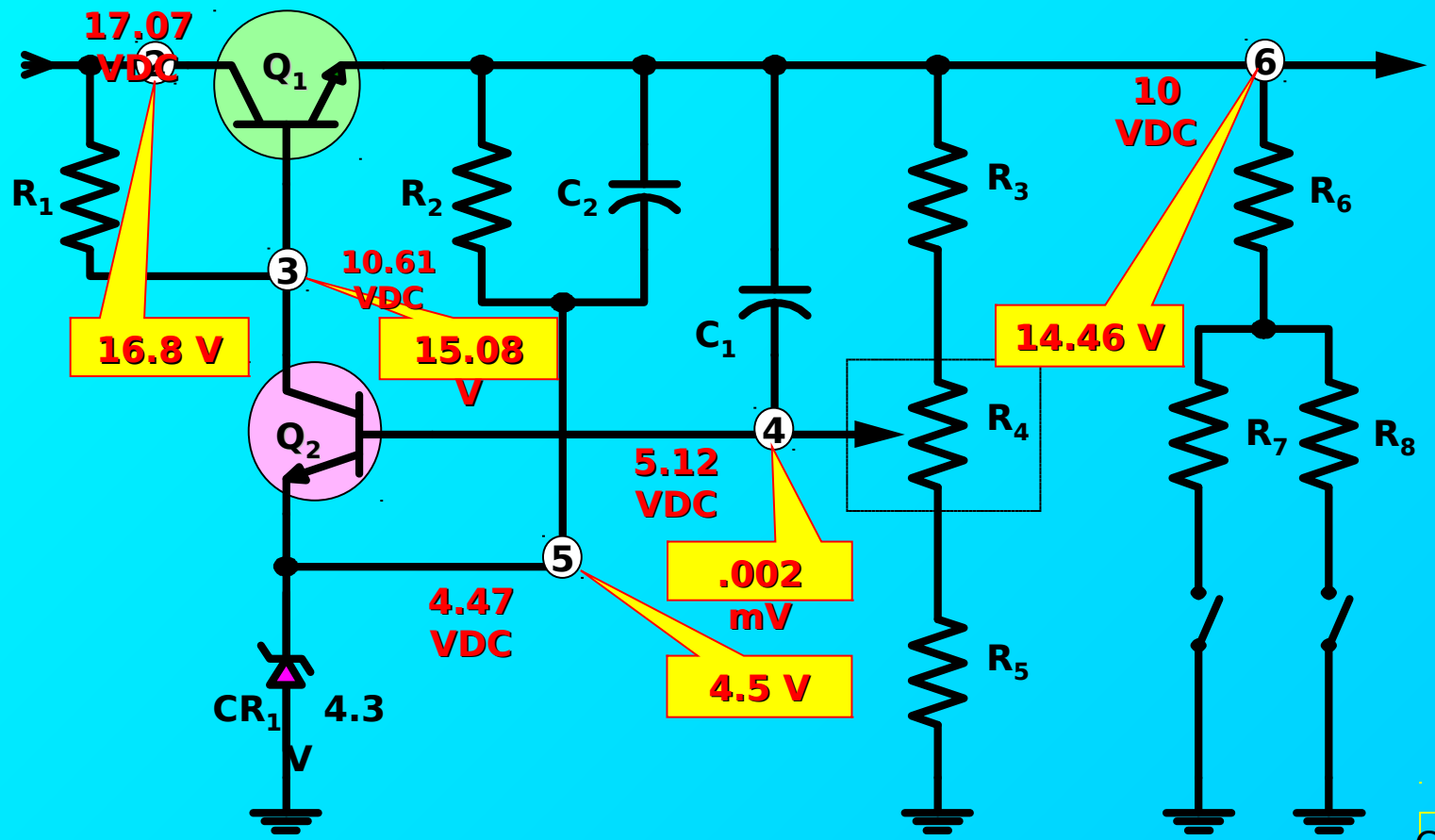
PC 26: Trouble Shooting, Malfunction 2.



Challenge

TII: Voltage Regulators

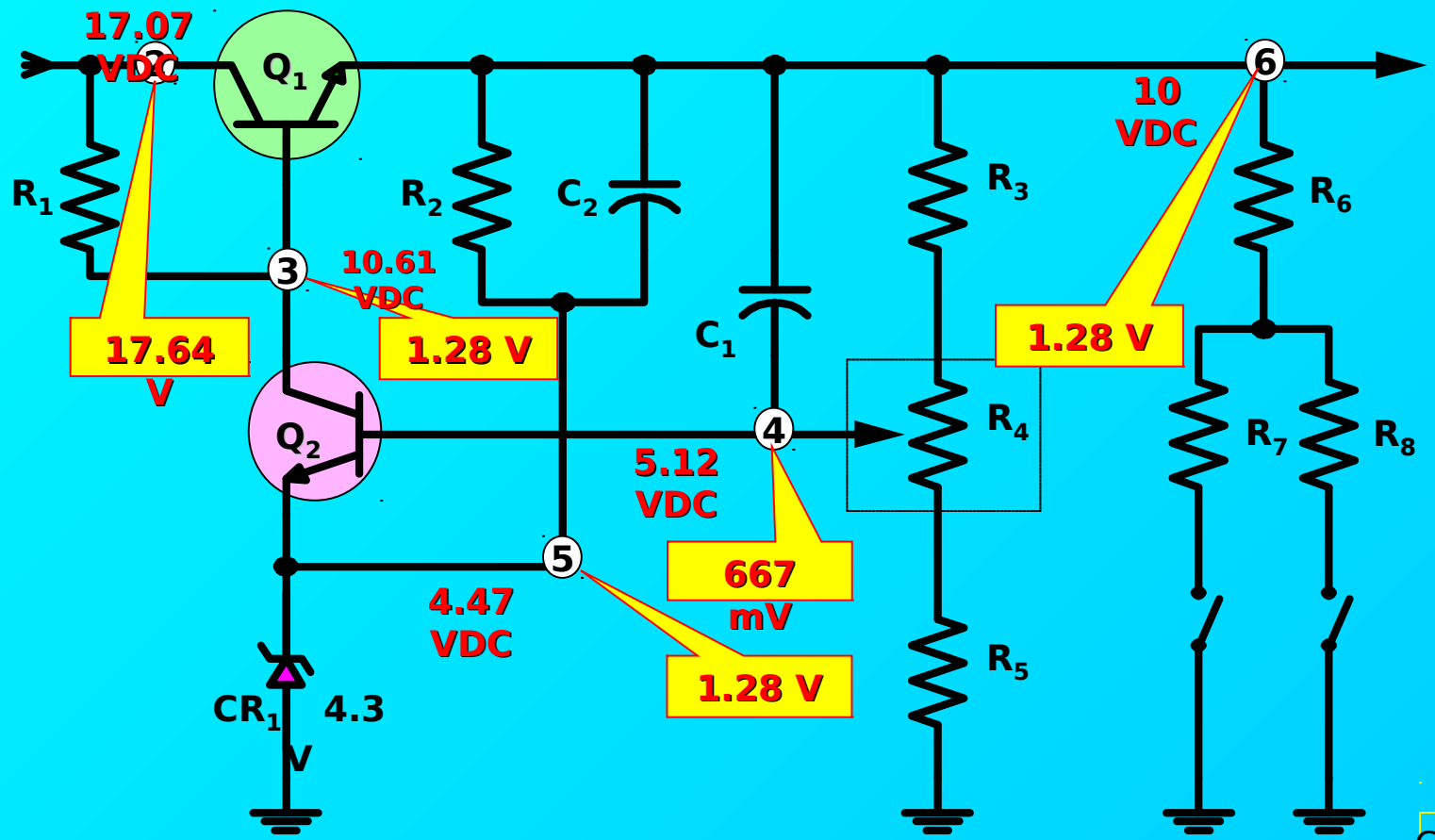
PC 26: Trouble Shooting, Malfunction 3.



Challenge

TII: Voltage Regulators

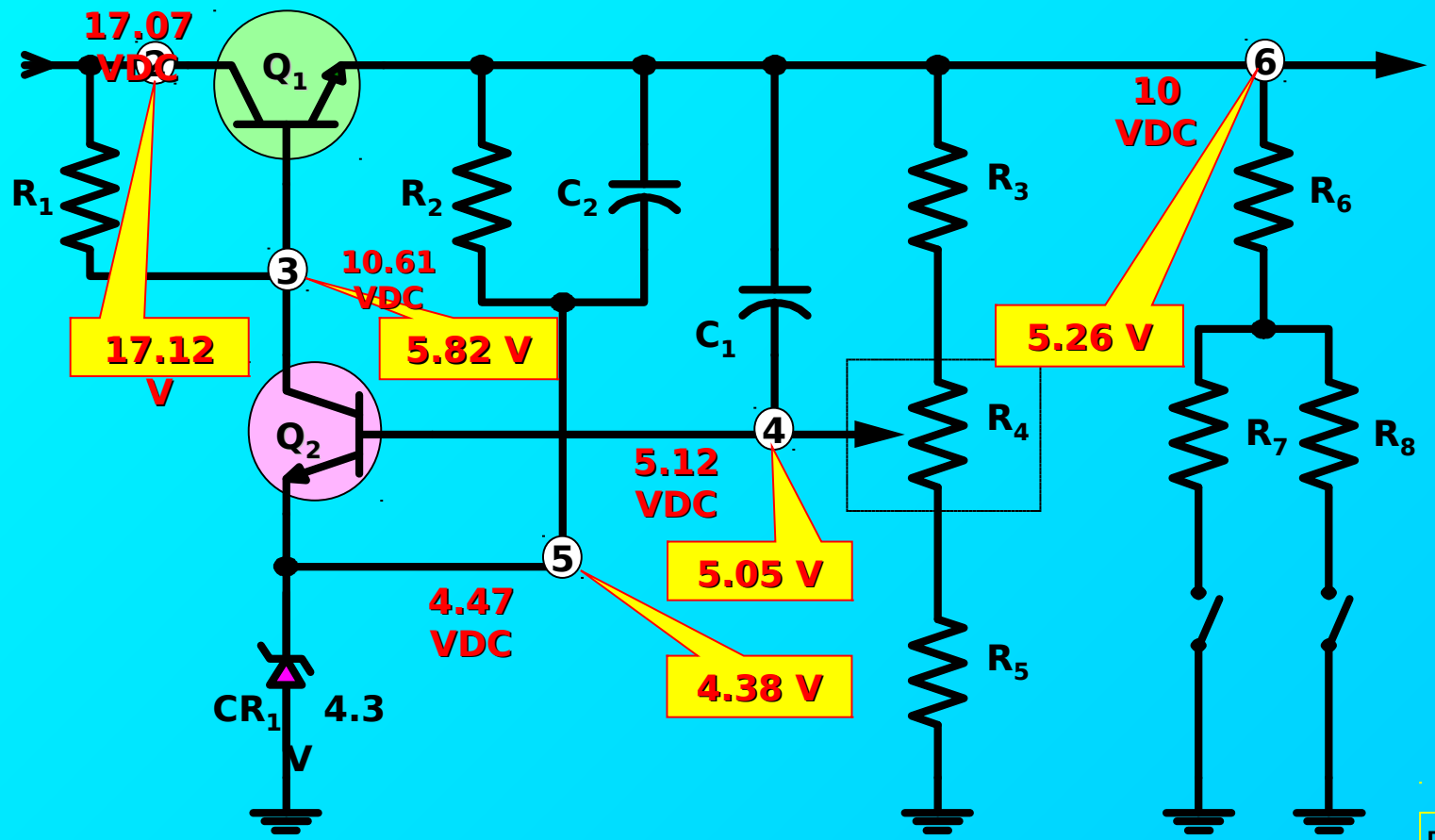
PC 26: Trouble Shooting, Malfunction 4.



Challenge

TII: Voltage Regulators

PC 26: Trouble Shooting, Malfunction 5.



Review ?

TII: Voltage Regulators

Review Questions:

1. What is the purpose of a voltage regulator? _____
2. In a series voltage regulator, the regulating component is in [Series or Parallel] W/ the load.
3. As the current load for a voltage regulator increases, the total load resistance _____ .
4. Draw a schematic symbol of a Zener Diode.
5. What is the purpose of a Zener Diode? _____ .
6. What is one of the limitations of a Zener Diode? _____ .
7. What must be done to a Zener to have a proper bias applied to it? _____ .
8. Name two types of voltage regulators taught in this lesson. _____ , _____ .

Answers

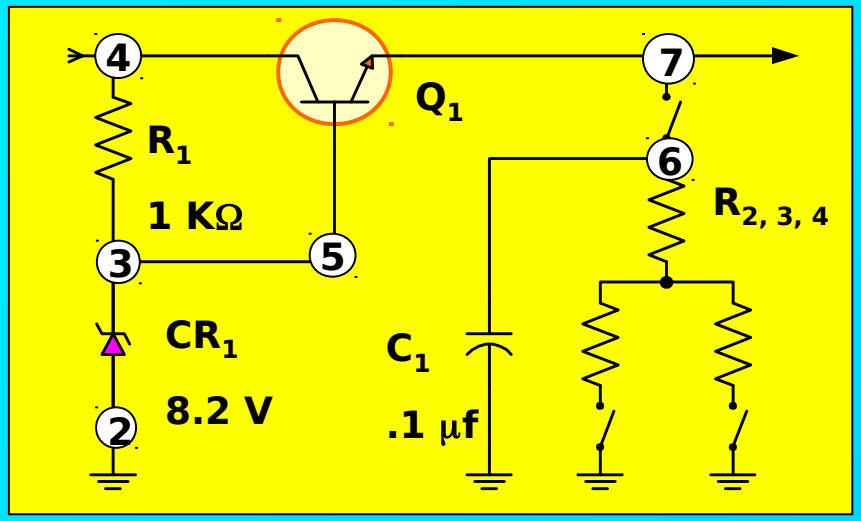
TII: Voltage Regulators

Review Questions: Refer to PC 25.

9. CR1 is a 8.2 V Zener. How much voltage is dropped across CR1? ____

10. What voltage would be measured @ TP5 if CR1 is open. _____

11. What would happen if a Zener Diode has too much voltage applied to it? _____



Answer 9 -11

TII: Voltage Regulators

Review Questions: Refer to PC 26, for ? 12-19.

12. In Ckt PC 26, What is the purpose of R3, 4, & 5?

    _____

13. What would happen if R3 opens ? _____

14. What controls the Emitter voltage of Q2?

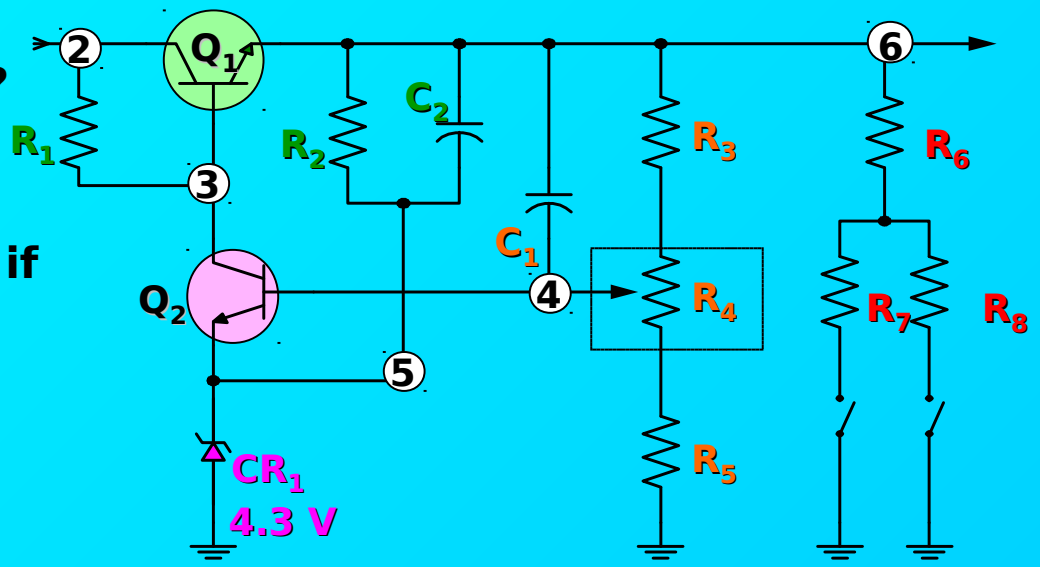
    _____

15. What would be the indications if CR1 opens ?

    _____

16. Tp6 read high, Tp4 very low, TP5 no change, TP3 increased, What is the Malfunction ?

    _____



Answers

TII: Voltage Regulators

Review Questions: Refer to PC 26, for ? 17-19.

17. Output reads high, Tp4 is high, TP5 & 3 increased, What is the malfunction?_____

18. Which component is the regulating device? _____

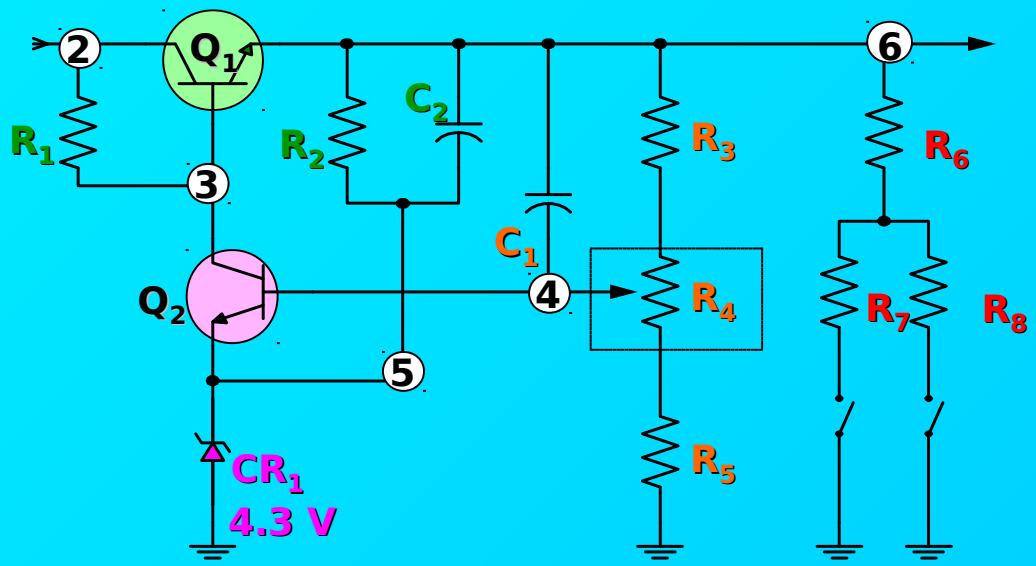
19. The point @ which reverse bias causes a sharp increase in reverse current is called?

    a. Self Bias

    b. Forward Bias

    c. Peak Inverse Voltage

    d. Peak forward Bias



Answers

TII: Voltage Regulators

Lesson Test:

Lesson Test:

Standard: 10 Questions W/in 20 Minutes. 70% Minimum Accuracy. Reference: PC 25 & 26.

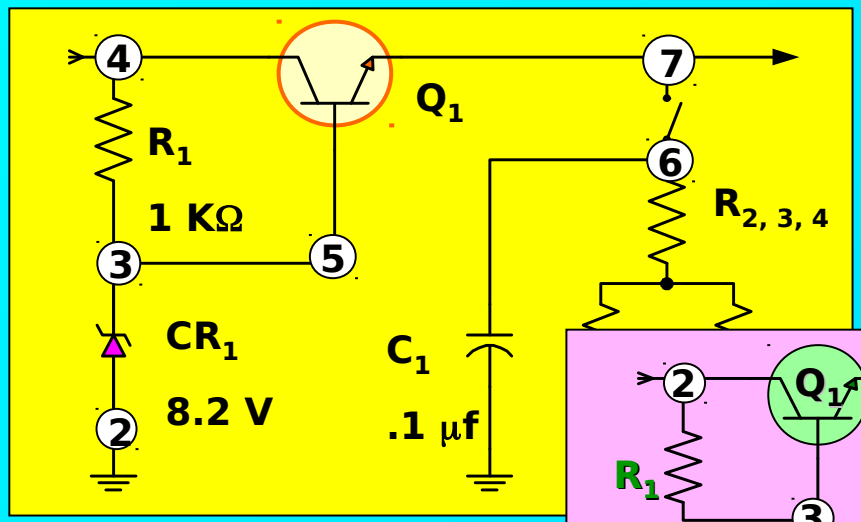
PC 25 & 26

PE Write up

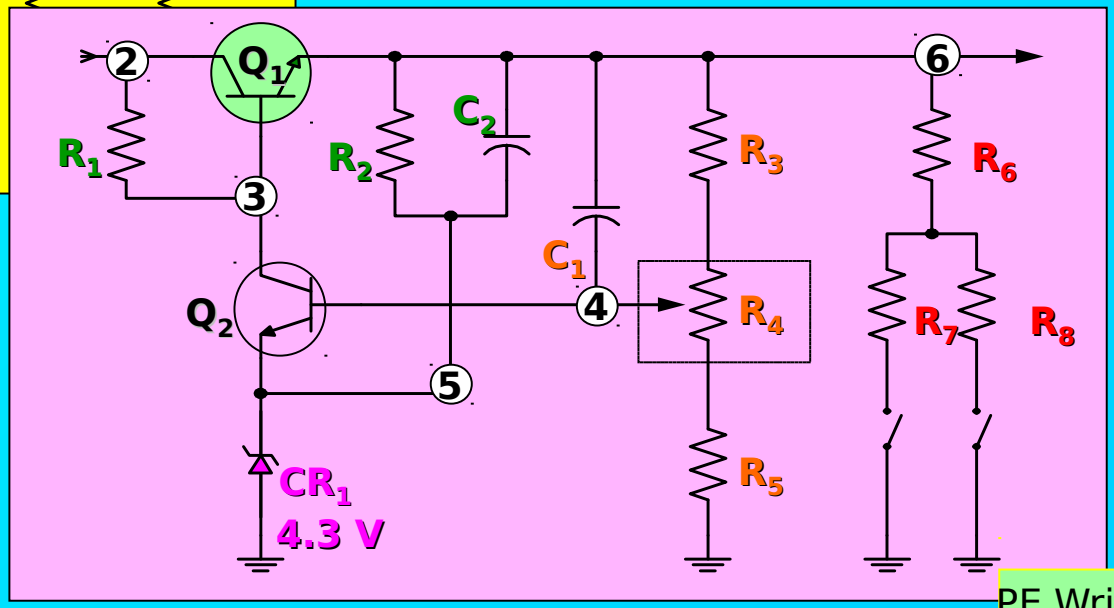
PE Setup

TII: Voltage Regulators

PC 25 & 26:



PC 25



PC 26

PE Write up